Vol. 41 No. 8

BULLETIN

OF THE

TORREY BOTANICAL CLUB

AUGUST, 1914

A revision of the genus Vittaria J. E. Smith

I. The species of the subgenus Radiovittaria

(WITH PLATES 15–20 AND SEVEN TEXT FIGURES)

RALPH C. BENEDICT

In an earlier paper on the genera of the fern tribe Vittarieae* the writer endeavored to point out the natural generic and subgeneric groups of the tribe, to discuss as well some of the interesting morphological features, and to indicate also the probable relationships of the genera. The present paper deals with the species of one of the subgenera of *Vittaria* indicated in the earlier paper. Most of the work of which the results are presented here was done before the paper on the genera was published, but completion was delayed until the present. As indicated by the title of this article, it is intended to continue the study of the species of *Vittaria*, and it may be added, most of the necessary work has been accomplished.

The genus *Vittaria* as delimited in the writer's paper already cited includes all those species of the tribe Vittarieae which have a midvein with uniseriate lateral areolae along each side formed by the pinnate interlocking simple veinlets. (See FIGS. 1–3; also the illustrations of venation under each plate.) As it appears, this type of venation is practically unique among ferns, the only possible exceptions being two or three species in the genus *Polypodium* L., as used in a broad sense. From such species as these the species of *Vittaria* differ largely not only in general aspect,

* Bull. Torrey Club 38: 153–190. *pl. 2–8.* 1911.

[The BULLETIN for July (41: 351–390. *pl. 9–14*) was issued 28 Jl 1914.]

but in more critical characters of the scales, texture, and tissues, and especially in the uniform arrangement of the sporangia in indeterminate lines along the outer portions of the veinlets. (See FIGS. 1–7, and the plates.)

The taxonomic revision of *Vittaria* presents unusual difficulties as compared with other ferns, owing to the fact that although there appear to be a fairly large number of valid species—about forty—the very simple venation pattern allows only a small range of variation in the more evident characters of gross outline and venation, so that these, the characters ordinarily used in differentiating fern species, are not available. Nearly all the species are grass-like in the outline of the leaves, and the problem is thus about the same as would be offered by a genus of grasses if no flowers and fruit were obtainable. In the case of some few species, the differences in size, outline or coloration of the leaves, or in the venation, are sufficiently marked to allow of specific determination, but in general it is necessary to study the plants microscopically and by sectioning the stems and leaves, to arrive at any understanding of the real specific characters. It has been found by this method of study that there are very considerable differences in the outline of the leaf petioles and blades as best shown in cross-section, in the arrangement of the vascular tissues in the stem and petioles, and in the kind of cortical tissue developed. The scales which cover the stems and leaf-bases, although of one pattern, often show well-marked differences in cell structure. There may also be important differences in the shape of the spores and paraphyses.

Some of the differences in these characters have been indicated by one writer or another during the last sixty years or so, but no one has used them consistently or accurately over any number of species. The last and only monographic treatment of the whole genus was that by Fée* who attempted to figure the scales, spores, and paraphyses, as well as the general appearance of the species he recognized. Unfortunately he seems to have been inaccurate. Müller† discovered differences in the scales which seemed to him to justify the description of several new species, but he appears unfortunately to have missed the really important

* Mém. Foug. **3**: 1852.

† Bot. Zeit. 537. *pl. 13.* 1854.

features of scale differences and to have made several species from what should properly be included in only one. Mettenius* and Luerssen† described and figured accurately some of the important differential characters of leaf outline as seen in section, but neither writer covered many species. More recently Jeffrey‡ and Mrs. Britton and Miss Taylor§ have described and figured carefully the morphology of one or two species each. The present paper represents an attempt to describe and figure as thoroughly as necessary the differential characters of the seven species included in the subgenus *Radiovittaria*, as I have recently described it. As has been noted, these seven species are all American.

The work of which this paper, as also the earlier paper on the genera of the tribe Vittarieae, is a partial report, has been carried on intermittently during the last six years at the New York Botanical Garden. The present article was brought nearly to completion during a month's residence as research scholar during parts of November and December, 1911, also at the N. Y. Botanical Garden, and I am glad to acknowledge my indebtedness to Dr. N. L. Britton for the opportunities of study thus afforded. In general the material studied has been sufficiently cited in my earlier paper on the genera of the tribe, but important additional material has been received from the collections of Mr. W. R. Maxon in Panama, and I have also been greatly aided by Mr. Maxon's descriptions of the field conditions under which his material grew.

The present paper deals with less than one fifth of the total species of *Vittaria*, but in order that the problems of the characters and nomenclature may be clear at the start, a description of the genus and its synonymy are included and also a discussion of its division into subgenera.

VITTARIA J. E. Smith, Mem. Acad. Turin **5**: 413. *pl. 9.* 1793

(Type species *Pteris lineata* L.)

Haplopteris Presl, Tent. Pterid. 141. 1836.

---

* Fil. Hort. Bot. Lips. 25–27. *pl. 27, f. 21, 22.* 1856.

† Schenk & Luerssen, Mittheil. Bot. **1**: 57. *pl. 11–19.* 1871.

‡ Phil. Trans. Roy. Soc. London **195 B**: 119–146. *pls. 1–6.* 11 Je 1902.

§ Mem. Torrey Club **8**: 185–211. *pl. 28.* 1902.

(Type species *Pteris scolopendrina* Bory)

Taeniopteris Hooker, Gen. Fil. *pl. 76 B.* 1842.

[Type species *Vittaria Forbsei* Fée = *V. scolopendrina* (Bory) Thwaites]

Taeniopsis J. Smith, Jour. Bot. 4: 67. 1841.

(Type species *V. lineata* [L.] J. E. Smith)

Ferns usually of epiphytic habit and of comparatively small dimensions, of herbaceous texture and entirely without sclerenchymatous tissue; stem slender, creeping, clothed with clathrate scales, the vascular tissue in the form of a tube (siphonostele) or a simple net (dictyostele); the phyllotaxy distichous or radial; leaves usually few, linear to linear-elliptic, usually grass-like in outline, the epidermis with scattered linear cystoliths, the leaf-trace single or double, the venation consisting of a midvein with pinnate branches which anastomose anteriorly to form a row of simple areolae along each side of the midvein; sporangia in two indeterminate submarginal or sometimes practically marginal lines along two continuous receptacles formed by the outer portions of the veinlets, the receptacle usually in a groove often of considerable depth and sometimes with the edges produced so as to serve as an indusium; a true indusium wanting; spores diplanate or triplanate; paraphyses usually present, consisting of large reddish or yellowish cells borne on simple or branching pedicels.

The generic name *Vittaria* is fortunately well established. It was based originally on a single species, *Pteris lineata* L., so that there is no difficulty as to its typification, notwithstanding the fact that by several writers another species has been recognized as type. *Pteris lineata* has even been made the type of another genus, *Taeniopsis* J. Smith. Smith based his division of *Vittaria* on the position of the sporangial line, including in *Euvittaria* the species of the type of *V. elongata* Sw., in which the fruiting line is practically marginal, the leaf margin being double and including the sporangia between the two lips. This type, however, as Luerssen has shown, is not generically different from that of *V. lineata*, in which the lines of sporangia are clearly submarginal and dorsal. The extremes of the two types are connected by all possible intermediate forms among the various species.

Haplopteris Presl was based on the largest species in the genus,

V. scolopendrina (Bory) Thwaites. Superficially this is very different from species like *V. lineata* and *V. sikkimensis* Kuhn, but in its essential characters it does not appear to have even subgeneric differences from *Euvittaria*. *Taeniopteris* Hooker is a straight synonym of *Haplopteris*, as its original species seems to be identical with *V. scolopendrina*.

The only other possible nomenclatorial difficulty in connection with *Vittaria* concerns the name *Oetosis* Necker,* published in 1790. Of course if this name were to be found valid, its seniority of three years would give it precedence of *Vittaria*. It is, however, like most of Necker's names, quite without definite typification, and if recognized as originally described, would comprise in its six Linnaean species five widely separated genera. I make this statement with entire assurance notwithstanding the fact that Dr. E. L. Greene has concluded from the same evidence that Necker intended *Oetosis* to include only one Linnaean species, *Pteris lineata*, the type of *Vittaria*. Since Christensen also is not certain that *Oetosis* might not properly replace *Vittaria*, it may be worth while to give in some detail the evidence which needs to be considered, particularly as it bears on questions relating to other Neckerian names.

To begin with, it may be stated that Dr. Greene's error springs from two incorrect premises. These are: first, that Necker intended his description of *Oetosis* to be applied only to one Linnaean species of *Pteris*, instead of to several; and second, that when Necker referred to Linnaean plants, he had reference to the first edition of Species Plantarum and to no other work of Linnaeus. I am indebted to Dr. J. H. Barnhart for the discovery of both these inadvertencies.

In correcting the second of these mistakes, it is almost sufficient to suggest that it is scarcely probable that Necker would have used such an out-of-date work as the first edition of the Species Plantarum when there were two later editions of the same book, as well as several later editions of Linnaeus's Systema Naturae, the latest of these having appeared in 1784, six years before Necker's Elementa Botanica appeared. The case is about the same as at present with the various editions of the floras of the

* Elementa Botanica 3: 318. 1790.

United States. Only the latest editions are of any general interest or use.

For incontrovertible evidence, however, that Necker used later texts than the 1753 Species Plantarum, I am able to cite two distinct references which I owe to Dr. P. A. Rydberg and which definitely identify the Linnaean work to which Necker is referring as the fourteenth edition of the Systema Naturae, the work of John Murray and not of Linnaeus. These references are Necker, Elementa Botanica **2**: 94, and **3**: 12.

The other of Dr. Greene's misconceptions has to do with the wording of Necker's original description of *Oetosis*, which is as follows:

1726. CHAR. DIAGN. *Lineae*, parallelae, ad periphaeriam frondium, in aversa pagina.
Frondes simplices.
CHAR. PEC. *Fructific.* lineae parallelae, ad periphaeriam in aversa pagina frondium sitae.
Globuli, coacervati; singuli, annulo elastico cinguntur.
Besimina in globulis inclusa, exigua, fertilia.
Individua neutra in hac specie, stipitata.
Frondes simplices. Quaed. Pterid. *Linn.*

In the first place, it seems to me *a priori* improbable that Necker could have intended this description to apply to only a single Linnaean species of *Pteris*. "Quaed." is of uncertain number as far as its form is concerned, but I believe in this case it is certainly plural. A general examination of Necker's text will show that the generic names used are either Linnaean names or else they are new; that is, apparently he has either retained the Linnaean genera exactly, or he has divided them, retaining the old name for part of the species and proposing a new name for the others. Often in such a case, it is evident that Necker's new genus corresponds exactly to some species-group recognized by Linnaeus. The present case furnishes a good illustration of this point.

The genus *Pteris* as delimited in the first edition of Species Plantarum (and later texts) is divided into three groups as follows:

"Frondibus simplicissimis
"Frondibus simpliciter pinnatis
"Frondibus sub-compositae"

Necker retains *Pteris* to include, as he writes, "*frondes compositae.*" In *Oetosis*, however, the leaves are "simplices," and it is reasonable to suppose that he meant to include under this name all the Linnaean species of *Pteris* with simple leaves. In the 1753 Species Plantarum there are four of these, but by 1767 two others had been added, and this is also the number in Murray's edition of the Systema Naturae of 1784. This fact seems to have been overlooked by Dr. Greene, but it was noted by Kuntze, who in attempting to validate *Oetosis*, selected as type of the genus the first species named in the later Linnaean works, i. e. *Pteris piloselloides* L., which, however, was not among the four known to Linnaeus in 1753. Thi would identify the genus with a group of the tribe Polypodieae, now known either as *Drymoglossum* Presl, or perhaps more properly as *Pteropsis* Desvaux.

It is probably unnecessary to pursue further the *ignis fatuus* of a type for *Oetosis*, but it may be stated with certainty as additional confirmation of the invalidity of this name that Necker's description does not, as was Dr. Greene's main contention, fit *Pteris lineata* better than any other of the simple *Pterides* known to Linnaeus. The specific phrase which he cited as diagnostic, "lineae parallelae," may be applied as well to the *Pteris piloselloides* of Linnaeus, but it is scarcely probable that Necker had any thought of distinguishing generically between one species which has sporangial lines exactly parallel as in *Vittaria lineata*, and another in which the lines diverge from the parallel one or two degrees as in Linnaeus's *Pteris lanceolata* and others.

Subgenus RADIOVITTARIA Benedict, Bull. Torrey Club 38: 166. 191

Stem radial, phyllotaxy polystichous, leaf-trace always single, stem and petioles brown, owing to the highly developed collenchyma. Spores diplanate, paraphyses with cupuliform terminal cells.

The radial stem structure and leaf arrangement as well as the specialized collenchyma (see FIG. 6) serve to separate the species included from the other species of the genus, which also show a much wider range of characters.

In the key which follows, the species are arranged as nearly as

possible according to natural relationships. *V. minima*, the simplest of the species treated, belongs at the bottom of the series, and is probably like the primitive form from which the others have been derived. The remaining six species fall naturally into two groups as indicated.

In connection with the species-descriptions, complete citations of the specimens examined are given. The letters following the individual citations refer to the herbarium in which the specimen is located. "U" represents the Underwood Fern Herbarium of the New York Botanical Garden; "N" the National Herbarium at Washington; "E" the Eaton Herbarium at Yale; "C" the Herbarium of the Botanisk Museum of Copenhagen.

Leaves 3–6 mm. long.	1. *V. minima.*
Leaves more than 6 mm. long.	
Petioles 2-angled from near the base, lamina with a ventral ridge along the midvein	
Sporangial line 0.5–1 mm. from the margin, lamina linear.	
Lamina less than 1 cm. broad (4–7 mm.), the areolae longitudinal.	2. *V. Gardneriana.*
Lamina usually more than 1 cm. broad, the areolae oblique.	3. *V. remota.*
Sporangial line 2–3 mm. from the margin, lamina elliptic to lanceolate.	4. *V. latifolia.*
Petioles terete or oval in section except near the top, lamina without a ventral ridge.	
Scales unicostate (rarely 2–3 costate), sporangia in two narrow deep grooves about 0.5 mm. from the margin.	5. *V. stipitata.*
Scales always pluricostate, sporangia in a shallow groove 1–1.5 mm. from the margin.	
Lamina 4–10 mm. broad, the margins parallel, scales of the petiole longer and narrower than those of the stem.	6. *V. Ruiziana.*
Lamina 8–14 mm. broad, narrowed both ways from the middle, scales all alike, with heavy costae.	7. *V. Williamsii.*

1. VITTARIA MIMINA (Baker) Benedict, Bull. Torrey Club **38**: 164. 5 My 191

Antrophyum minimum Baker, Ann. Bot. **5**: 448. 1841.

Hecistopteris minima Benedict, Bull. Torrey Club **34**: 457. 19 O 1907.

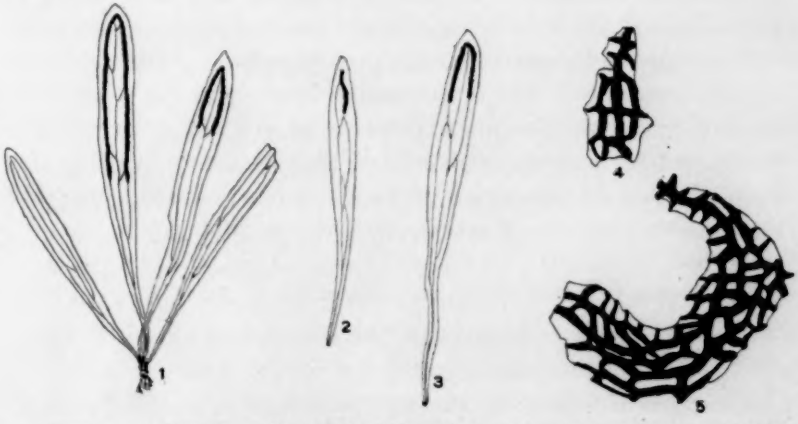
Antrophyum Werckleanum Christ, Bull. Herb. Boiss. II. **5**: 11. 1905.

Hecistopteris Werckleana Christ, Bull. Herb. Boiss. II. 7: 265. 1907.

Stem slender, 4–5 cm. long, the scales small, often contorted, 4–6 cells wide at the base, the costae rather heavy; leaves few, spreading, 3–6 cm. long, the petiole brownish, the lamina oblong or lanceolate, broadest about the middle, 4–7 mm. broad, long-acute or sometimes blunter and forked, the margins plane, the leaf-trace single, dividing to form 2–8 veinlets, the areolae parallel to the midvein; sporangial line nearly straight, 1.5–2 mm. from the margin, superficial, the paraphyses as in the other species of the subgenus. (TEXT FIGS. 1–5.)

TYPE from COSTA RICA: *Endres, 1869*, 5,000 ft. altitude.

SPECIMENS EXAMINED. COSTA RICA: (without definite localities), *Endres*, type; *Wercklé*, 1903 (= *Hecistopteris Werckleana* Christ).



FIGS. 1–5. *Vittaria minima* (Baker) Benedict. Figures 1–3 show general habit of species, soriation, and venation. (All natural size.) Figures 4 and 5 illustrate a small and a large scale from the stem (enlarged about 60 times). All the drawings are from material of the original collection of Endres.

To *Vittaria minima* may be accorded the distinction of being the simplest species in the genus, and it is also one of the few species of *Vittaria* which can be adequately differentiated by a knowledge of its more evident characters of size and venation. There is no other American species with which it need be confused, and the smallest Old World species, *V. sikkimensis* Kuhn, has a different outline and texture and bears the sporangia in distinct

grooves, to say nothing of other marked differences. The material illustrated (*Endres*) does not show the narrowed apices believed to be characteristic of the species, but the blunting appeared to be abnormal. In the Wercklé material, of which two plants and a photograph of a series of plants were seen, the narrowed almost acuminate tip was an evident character.

Vittaria minima, in spite of its obvious differences from the other species, falls naturally into the genus and into the subgenus *Radiovittaria*. There was so little material that no attempt was made to section the stem or petiole, but the brown coloration of the petiole probably indicates the presence of the kind of collenchyma found in this subgenus. The fact that the spores and paraphyses are indistinguishable throughout the seven species is further evidence of close relationship.

It is also worthy of note that there appear to be good grounds for believing that *V minima* is a real connecting species between *Vittaria* and *Hecistopteris* J. Smith, as has already been indicated in the synonymy. The occurrence of identically the same type of paraphysis and spore in *Hecistopteris*, as well as the suggestively similar leaves sometimes developed in this genus, lead to the suspicion that *Hecistopteris* is probably more a genus of taxonomic convenience than one of generically different evolution.

2. VITTARIA GARDNERIANA Fée, Mém. Foug. **3**: 15. *pl. 3*. 1851

Vittaria Karsteniana Mett. Ann. Sci. Nat. Bot. V. **2**: 207. 1864. (Type from Colombia.)

Vittaria gracilis Kuhn; in Moritz, Linnaea **36**: 67. 1869. (Type from Colombia.)

Rhizome erect, unbranched, 1.5–2.5 cm. long, with the persistent petiole bases about 0.05 cm. thick (about 2 mm. thick in section), radially symmetrical, the scales brown, iridescent, soft, lanceolate, 5–8 cells wide at the base. Leaves several, erect or spreading, 20–40 cm. long, usually very thin, the petiole solid, about 1 mm. thick (less when dry), terete at first, but soon becoming flattened and angled laterally, dull brown or greenish brown, or becoming polished, 1–3 cm. long, the lamina broadest (3.5–7 mm.) near or just above the middle, narrowed very gradually above and below, with or without a median brown stripe extending a few centimeters along the surface from the petiole, either thin, and with all the veins prominent, or thicker, and with

the veins immersed, but with a strong convexity over the midrib along the ventral surface, the margins acute, plane, the leaf-trace single, thick-reniform in section, branching in the very base of the petiole to form the midrib and secondary veinlets, the veinlets intersecting, 1.5 cm. apart along the margin, the marginal portions forming a nearly straight line, the areolae with their axes parallel to the midrib; soral line nearly straight, about 0.5 mm. from the margin, sunken in a shallow open groove, the paraphyses numerous, pyriform, becoming collapsed and wrinkled, the spores diplanate. (PLATE 15.)

TYPE from BRAZIL: Organ Mts., *Gardner 147*, 1837.

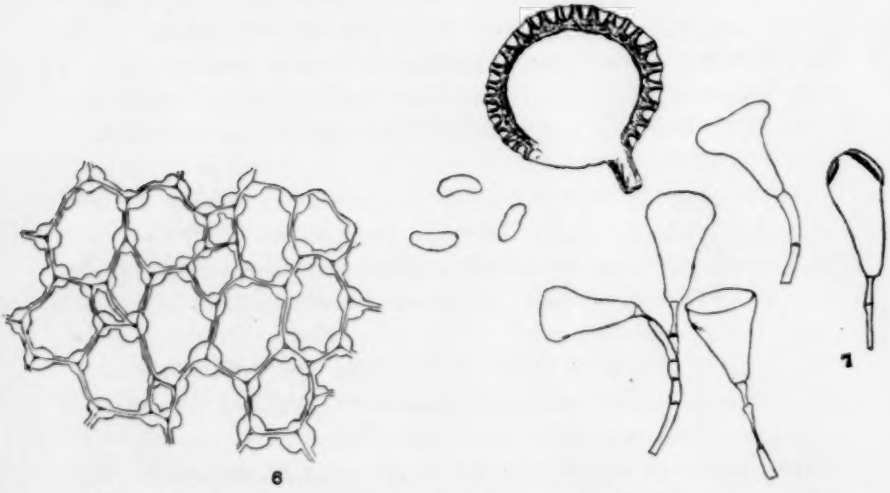
SPECIMENS EXAMINED. BRAZIL: Organ Mts., *Gardner 147* (scraps of type, U); *Glaziou 3553* (C). COLOMBIA: Santa Marta, 6000 ft., *H. H. Smith 1112 in part* (several plants, U, N); Bogota, *Lindig 176, vide V. Karsteniana* (U). VENEZUELA: Tovar, *Fendler 259 b* (U, E). ECUADOR: "crescit in silv. trop. et suband.," *Sodiro* (U); *Jameson 1116* (E); Quitensian Andes, *J. P. Couthouy 25*, 1885 (E). BRITISH GUIANA: Mt. Roraima, *Mt. Roraima Expedition 212*, 12 Nov. 1884 (N).

Fée cites in addition: MEXICO, *Goudot, Pl. Mex.* and Colombia, *Moritz 1226*. For *V. Karsteniana* Mettenius cites specimens as follows, all from COLOMBIA: San Pedro, prov. Ocaña, *Schlim 318;* Bogota, altit. 2,800 m., La Peña, altit. 2,900 m., *Lindig 176;* Quindio, altit. 3,000 m., *Triana;* Tolima, *Goudot*. The type of *V. gracilis* is from COLOMBIA: Tovar, *Moritz 464*.

Vittaria Gardneriana and *V. remota* are species of similar habit and appearance and are undoubtedly closely related to each other. Broad leaves of *V. Gardneriana* are not easy to distinguish from narrow leaves of *V. remota*, but in general, taking whole plants, the differences in breadth of leaves, etc., appear sufficiently constant to warrant the recognition of two species, especially as these differences seem to accompany partly separated geographic ranges. The material from Central America, where both species occur, offers no special difficulties in differentiation, even in the herbarium, and it is not unlikely that field study will discover additional differences. *V. Bommeri* Christ, referred to later in the present article as a species of uncertain identity, is apparently of the same general size and shape as *V. Gardneriana*.

3. VITTARIA REMOTA Fée, Mém. Foug. 7: 26. *pl.* 20, *f.* 1. 1857

Rhizomes erect, often associated in clumps of 5 or 6, 0.5–2 cm. long, about 2 mm. thick in section, radially symmetrical, the scales lanceolate, brown, 7–11-costate at the base, the median costae considerably thickened; leaves 2–10, cespitose, 15–42 cm. long, the petioles purplish-brown, sparsely verrucose, solid, 1–5 cm. long, about 2 mm. thick, nearly terete at first but soon flattened and angled, the laminae linear-lanceolate, broadest (6–18 mm.), about the middle, somewhat acuminate, below very gradually narrowed and marked with a dark brown stripe both ventrally and dorsally, the margin plane, thin and sharp, the leaf-trace single, branching in the base of the petiole, the midrib marked ventrally by a distinct angled ridge, whitish on the dorsal surface, veinlets 4–9 per cm.,



FIGS. 6 and 7. *Vittaria remota* Fée. FIG. 6. Well-developed collenchyma from the stem. (Material collected by *P. Wilson 81*, Porto Rico. Enlarged about 300 times.) FIG. 7. Showing spores, paraphyses, and a sporangium. (Enlarged about 60 times.) Two of the paraphyses, the lower two, are shown partly collapsed, their usual condition when dry. (From material collected by *R. S. Williams 889*, Panama.)

intersecting 0.5–1.5 cm. apart along the margin, the areolae linear, with the long axes usually divergent from the midrib; soral lines slightly crenate, 0.5–1 mm. from the margin, in an open shallow groove. (PLATE 16 and TEXT FIGS. 6, 7.)

TYPE from COLOMBIA: province of Ocaña, altit. 2,400 m., on trees in forest, *L. Schlim 611*, 1846–52.

SPECIMENS EXAMINED. VENEZUELA: Tovar, *Moritz 143 in part* (U); Tovar, altit. 2,300 m., *Fendler 260* (U, E). PANAMA: Cana, 2,000 m., *R. S. Williams 889* (U). COSTA RICA: La Palma, altit. 1,450–1,550 m., *Maxon 397* (U, N); La Palma, *C. Brade*, 26 Mr 1908 (N); *L. C. Wercklé*, 1901–05 (U, N). JAMAICA: numerous collections by *Jenman* (U), *Underwood* (U, N); *Maxon* (U, N), *Harris* (U), and *Clute* (U, N). PORTO RICO: Sierra de Luquillo, *P. Wilson 81* (U, N); *Sintenis 1139* (U, N); Sierra de Naguabo, *Sintenis 5451* (U, N); El Yunque Mts., *Everman 674* (N); *Blauner 307* (U).

Vittaria remota seems to be the commonest West Indian species of this subgenus, at least as far as representation in herbaria is concerned. It is most easily distinguishable from the preceding species, as has been noted, by the greater breadth of the leaves. In scales and rhizome, it is generally similar.

4. **Vittaria latifolia** sp. nov.

Rhizome erect, unbranched, 1–2 cm. long, with the persistent petiole bases and roots about 5 mm. thick, 2–3 mm. thick in section, radially symmetrical, the leaves and roots arising from all sides, the scales ciliate, dull brown, very soft, lanceolate, 7–10-costate at the base, the costae uniformly slender; leaves 3–6, erect or spreading, 12–22 cm. long, the petioles solid, about 2 mm. thick, flattened and laterally angled except at the very base, dull brown or greenish, 1–4 cm. long, the scales like those of the rhizome but smaller, the lamina herbaceous, thin, narrowly lanceolate, broadest (1.5–2.2 cm.) near, usually somewhat above, the middle, acute with a blunt apex, narrowed very gradually below into the petiole, the margins thin, sharp, often reflexed, the leaf-trace simple, branching in the base of the petiole, the midrib evident along the ventral surface of the lamina as a slight but distinctly angled ridge, and marked below by a whitish line, the veinlets alternate, rather prominent when dry, whitish below, divergent from the midrib at an angle of 20°, bent forward near the margin and connivent with the anterior veinlet, the areolae thus formed simple, 3–4 mm. broad, elongate-rhomboid, the oblique sides about 20 mm. long, the marginal and costal sides about 10 mm. long; sporangia and paraphyses borne along the intersected portions of the veinlets, forming a continuous shallowly crenate soral line, 2–3 mm. distant from the margin, superficial or scarcely immersed, the spores diplanate, the paraphyses pyriform or cyathiform, rounded at first, but soon collapsing and becoming angular and ribbed. (PLATE 17.)

TYPE collected at Santa Barbara, BOLIVIA, altitude 5,500 feet, *R. S. Williams 1337*, 30 August 1902.

Vittaria latifolia is interesting as having the broadest laminae in proportion to their length of any species of the genus. It is so different from the ordinary type of *Vittaria* as represented by *V. lineata* that one might well be excused for regarding it as a different genus until the vittarioid venation is discovered. It represents an extreme development of the type seen already in *V. remota* and *V. Gardneriana*, but is well differentiated from these not only by its greater width, but by scale characters as well.

5. VITTARIA STIPITATA Kunze, Linnaea 9: 77. 1835.

Rhizome erect, 1–2 cm. long, usually branching several times, the branches fasciculate, forming a close cluster 0.5–2 cm. thick, radially symmetrical, the scales linear, unicostate, or sometimes with 2–3 costae at the base, thick and bent.

Leaves pendent, one or two on each rhizome branch, 12–100 cm. long, the lamina linear, parallel-sided through much of its length, gradually narrowed above and below (about 0.75 mm. thick), the surfaces usually smooth and plane, or sometimes with a low median ridge along the ventral surface, the margins thick, usually blunt, the petiole 3–9 cm. long, about 1 mm. thick, brown or purplish-brown, hard, partly hollow, terete below becoming flattened dorsiventrally and angled in the upper part, the leaf-trace single, dividing to form the midvein and two lateral veinlets in the base of the petiole, the veins not evident on either surface of the lamina, the veinlets intersecting 2.5–4 cm. apart, along the margin, the areolae with the long axes longitudinal; soral lines straight, 0.5 mm. from the margin, in deep narrow grooves inclined to the margin. (PLATE 18.)

TYPE from PERU: (definite locality not given), *Poeppig 176*.

SPECIMENS EXAMINED, UNDERWOOD FERN HERBARIUM. BOLIVIA: Tigre Pata, 2,000 m., *R. S. Williams 1338*, 10 F 1902; Yungas, *H. H. Rusby 340*, 1885; Yungas, *M. Bang 353*, 1890. BRAZIL: prope Rheos, *Martius 386*, Herb. Flora Brazil, 1839. COLOMBIA: *H. H. Smith 1112* in part, 20 Au 1898 or 1899; Sierra de Onaca, Sta. Marta, "moderately common on trees in forest," *2538;* Minca Estate, near stream, Sta. Marta, 800 m. (2 sheets); Atrato and Truando, *Schott 61*, D 1857. COSTA RICA: *L. C. Wercklé*, 1901–1905; *Tonduz 12782* (scraps), N 1898. CUBA: *C.*

Wright 865, "Cuba orientali, prope villam Monte Verde; in arboribus," Ja–Ju 1859; forested slopes of the Finca las Gracias, Yaleras, Oriente, about 500 m.; on trunk of dead (lodged) tree, *W. R. Maxon 4476*, 5 My 1907. JAMAICA: vicinity of Troy, 600–660 m., *W. R. Maxon 2972*, 30 Je 1904; on trees over Ginger and Ugly Rivers, St. Mary's Parish. *G. S. Jenman*, 1874–79. PANAMA: above Penonome, 650–1,000 m., *R. S. Williams 456*, Mr 1908; Cana and vicinity, 1,900 m., *R. S. Williams 890*, Ap-Je 1908. PERU: Cumbassauma Mts. (scrap); *Poeppig 176* (scraps of type).

SPECIMENS EXAMINED, U. S. NATIONAL HERBARIUM. BOLIVIA: Yungas, *Bang 353*. BRAZIL: *Riedel;* San Paulo, Rais da Serra, "ad arbores," *L. Wackett*, 1907; COLOMBIA: *H. H. Smith, 2568*, 800 m.; COSTA RICA: *Wercklé* (2); Las Vueltas, Tucurrique, 630 m., *A. Tonduz 12782*, N 1898. CUBA: *C. Wright 865; W. R. Maxon 4476*. ECUADOR: Rio Talesa, 1,400 m., *J. Rimhart 72*.

SPECIMENS EXAMINED, EATON HERBARIUM. COLOMBIA: Atrato and Truando *A. Schott 61*, D 1857. CUBA: Cuba orientali, *C. Wright*, Ja-Je 1859. (2). VENEZUELA: Tovar, 2,000–2,300 m., *A. Fendler 259*.

SPECIMENS EXAMINED, HERBARIUM OF THE BOTANISK MUSEUM. BRAZIL: San Paulo, Santos, *Riedel*. *H. Mosen 3526*. CENTRAL AMERICA: *Oersted*. COLOMBIA: *Moritz 143* in part.

The great variation in length of specimens included under this species is one of the most notable facts. There can, however, be no doubt as to the identification of all the material as this species. The unicostate scales give a simple and very easily applicable test by which it can be separated from the following species or any other of this group. It seems to grow under a wide range of conditions, this presumably accounting for the variation in size, the small specimens being probably only physiological forms. In the West Indies it rarely reaches as full development as in South America, but even the smallest specimens measured were usually fertile.

6. VITTARIA RUIZIANA Fée, Mém. Foug. **3**: 16. *pl. f. 3*. 1852

Vittaria Moritziana Mett. Ann. Sci. Nat. Bot. V. **2**: 207. 1864.
Vittaria Orbignyana Mett. in Kuhn, Linnaea **36**: 66. 1869.
Vittaria longipes Sodiro, Crypt. Vasc. Quitenses 417. 1893.

Rhizome erect, 1–2 cm. long, unbranched or branching to form a close cluster of shoots, each radially symmetrical, the scales 6–10-costate at the base, the median costa much thickened in the upper portion of the scale. Leaves pendent, 1–5 to each shoot, 40–70 cm. long, the petiole 5–15 cm. long, atropurpureous, hard, partly hollow, flattenedto the base, becoming 2-angled toward the lamina, the scales very narrow and elongate, 1–4-costate, the lamina linear, parallel-sided through most of its length, 4–10 mm. broad, narrowed gradually above and below, the dorsal surface plane or nearly so, the ventral surface with a broad low median ridge, the margins usually thin and sharp, often reflexed in old leaves, the leaf-trace single, dividing in the base of the petiole, the veins not evident on either surface of the lamina, the veinlets intersecting about 3.5 cm. apart along the margin, the areolae linear-rhomboid, the longitudinal sides about 3.5–4 cm. long, the oblique sides 2.5–3 cm. long. Soral lines straight, about 1–1.25 mm. from the margin, in a shallow open groove. (PLATE 19.)

TYPE from PERU: (definite locality not given), *Ruiz.*

SPECIMENS EXAMINED. COLOMBIA: Tablazo, Tuluá, *I. F. Holton 60*, 26 O 1853, "*V. stipitata*," "et in Ibaque" (U); Santa Marta, *H. H. Smith 1112* in part (N); *Lindig* (scrap, U). ECUADOR: S. Domingo, *Sodiro*, "*V. stipitata.*" VENEZUELA: Tovar, *Moritz 143*, *143b* (scraps, U); Tovar, *Fendler 259*, 1854–5, "*V. stipitata*" (E).

For *V. Moritziana*, Mettenius cites as type: Canoas, COLOMBIA, *Lindig 319;* for *V. Orbignyana:* Yungas, BOLIVIA, *d'Orbigny 229*. For *V. longipes*, Sodiro cites as type-locality: subandine woods of western range in the valley of Nanegal, near Anca (translated).

As may be seen from the synonymy this species has been recognized as distinct by several writers. The material of it is rather scanty, indicating that it must be rare. It furnishes an especially good illustration of the habit of writers of describing species of *Vittaria* on very insufficient data. It is possible of course that there may be more than one species represented under this name, but there are not now sufficient data for such differentiation, even on the basis of the most careful microscopic study, although much less than that was counted sufficient for the original descriptions.

The species is easily distinguishable from *V. stipitata* on the basis of the scales, which are broad, many-costate, and of two sorts.

The margins are also usually sharper than those of *V. stipitata*, and the sporangia are borne in shallower grooves.

7. **Vittaria Williamsii** sp. nov.

Rhizome erect, 0.5–1 cm. long, 2–2.5 mm. thick, unbranched, radially symmetrical, the scales small, lanceolate, blackish-costate at the base. Leaves 1–3, 25–70 cm. long, rather thick and rigid when dry, the petiole 10–15 cm. long, hard, terete or nearly so at the base, soon becoming flat and angled, hollow above the base, atropurpureous or green along the anterior ventral portion of the stipe, the lamina linear-lanceolate, 8–14 mm. broad, narrowed gradually both ways from the middle, plane or somewhat recurved, the apex somewhat acuminate, the margin thin, sharp, plane, the lower dorsal surface marked with a median purplish stripe extending up from the petiole: leaf-trace one, dividing in the base of the petiole, the midvein not evident on the surface, the veinlets not evident on the surface, intersecting 1.5–2 mm. apart, the areolae about 2 mm. broad, linear-rhomboid with the long axes at an angle of about 15° to the midvein; sporangia in a straight or slightly sinuate line, about 1 mm. from the margin, in an open very shallow groove. (PLATE 20.)

TYPE from BOLIVIA, Santa Ana, altitude 1,800 meters, *R. S. Williams 1349*, 29 Jl 1902.

Also collected at Yungas, BOLIVIA, altit. 1,300 m., *H. H. Rusby 339*. 1885.

It is always a pleasure to work with Mr. Williams's specimens owing to the excellence of their preparation. The present species is no exception. It is as well distinguished from the other species of this subgenus as is *V. latifolia* also collected by him. Its association is, however, clearly with the species of the *stipitata* alliance of which it is the broadest example.

SPECIES INQUIRENDA

Vittaria Bommeri Christ, Bull. Herb. Boiss. II. 5: 11.

I have seen a fragment of the original specimen of this species through the kindness of His Highness, Prince Roland Bonaparte, in whose herbarium it is deposited. I have not, however, enough to determine certainly the specific characters, although it appears to be close to *V. Gardneriana* Fée.

Explanation of plates 15-20

Unless otherwise noted, the reductions and magnifications are as follows: tracings of whole plants and leaves reduced one-half; leaf and stem sections enlarged twelve times; scales enlarged about thirty-five times. The sections and scales were drawn by means of a camera lucida.

PLATE 15. VITTARIA GARDNERIANA Fée

FIG. 1. Whole plant, showing general habit and soriation.

FIG. 2. Cross-section through leaf in fertile part.

FIG. 3. Cross-section through petiole, showing 2-angled character.

FIG. 4. Single broad leaf from another plant, showing venation.

FIG. 5. Cross-section same leaf, showing similarity to *V. remota* Fée.

FIG. 6. Cross-section of petiole of same leaf.

FIG. 7. Cross-section of another leaf through fertile portion.

FIG. 8. Cross-section of petiole of same leaf.

FIG. 9. Typical scale.

Specimens figured: figures 1–6, *H. H. Smith 1112*, Santa Marta, Colombia (this number includes also *V. Moritziana* Mett.—see *plate V*, and *V. stipitata* Kunze—see *plate IV, fig. 20*); 7–9, Gardner, Organ Mts., Brazil 1837, *probably part of type collection*.

PLATE 16. VITTARIA REMOTA Fée

FIG. 1. Whole plant, showing general habit, venation, and soriation.

FIG. 2. Cross-section through fertile part of leaf.

FIG. 3. Cross-section of leaf just below fertile part.

FIG. 4. Cross-section of leaf still lower down than preceding.

FIG. 5. Cross-section through petiole more than 2 mm. above stem, to show angled character.

FIG. 6. Cross-section through petiole just after it leaves the stem. The angles are not developed at this point, but the single leaf-trace has already given off the lateral veinlets.

FIG. 7. Cross-section through stem, showing origin of petiole—at left—and a still younger leaf-trace—at right. A root is shown just leaving the stem at the lower side.

FIG. 8. Cross-section of a broader leaf through the fertile part, showing that the sporangia are borne in a slight depression.

FIGS. 9–12. Cross-sections of same leaf, comparable to those in figs. 4–6, but each respectively lower than the corresponding one in the first series.

FIGS. 13–15. Tracings from leaves showing abnormal modifications in the venation.

Specimens figured: figure 1, *P. Wilson 81*, Porto Rico; 2–7, *L. M. Underwood*, Jamaica, 1903; 8–12, *R. S. Williams 889*, Panama; 13–15, from a plant grown at the N. Y. Botanical Garden, probably self-sown from Jamaica spores.

PLATE 17. VITTARIA LATIFOLIA Benedict

FIG. 1. Whole plant, showing general habit, venation, and soriation.

FIG. 2. Cross-section of leaf through fertile part, showing very slight depression in which sporangia are borne.

FIG. 3. Cross-section of leaf below fertile part.

FIG. 4. Cross-section of petiole about 2 mm. above stem.

FIGS. 5–8. Successive cross-sections of petiole less than 2 mm. from stem, showing single leaf-trace and its division.

FIG. 9. Cross-section of stem, showing origin of a petiole and a leaf-trace.

FIG. 10. Stem scale, showing cilia, most of which have been broken off.

All the figures were drawn from type material, *R. S. Williams 1337*, Bolivia.

PLATE 18. VITTARIA STIPITATA Kunze

FIG. 1. Whole plant, showing general habit and soriation.

FIG. 2. Cross-section of leaf in fertile part.

FIG. 3. Cross-section of leaf below fertile part.

FIGS. 4 and 5. Cross-sections of petiole more than 2 mm. above stem.

FIG. 6. Cross-section of stem showing origin of a petiole with a leaf-trace not yet divided.

FIG. 7. Whole plant, about the smallest seen.

FIG. 8. Cross-section of leaf of larger plant of same collection number.

FIG. 9. Single leaf attached to stem; the leaf was about the longest and broadest observed.

FIG. 10. Cross-section through fertile part of same leaf shown in fig. 9.

FIG. 11. Cross-section through fertile part of another somewhat different leaf.

FIGS. 12–14. Cross-sections of same leaf about where the blade narrows into the petiole. The shaded strip below represents the band of collenchyma which runs part way up the blade.

FIGS. 15 and 16. Scales with an unusual amount of cell development.

FIGS. 17–19. Scales of the usual type.

FIG. 20. An old scale from which the softer parts of the cells have been lost.

Specimens figured: figures 1–6, *W. R. Maxon 4476*, Cuba; 7 and 8, *R. S. Williams 1338*, Bolivia; 9 and 10, *H. H. Smith 2568*, Colombia; 11–14, 17–19, *R. S. Williams 890*. Panama; 15 and 16, *Wercklé*, Costa Rica; 20, *H. H. Smith 1112*, Colombia.

PLATE 19. VITTARIA RUIZIANA Fée

FIG. 1. Whole plant, showing general habit, venation, and soriation. The petioles are unusually short in this plant.

FIGS. 2 and 3. Cross-sections through fertile part of a leaf, showing pointed margin, and the sporangial groove, which is much shallower than in *V. stipitata* Kunze.

FIG. 4. Cross-section through petiole more than 2 mm. above stem, showing heavy collenchymatous development with aerated central portion. The leaf-trace has divided into the midvein and two lateral veinlets.

FIG. 5. Cross-section through fertile part of leaf of type collection.

FIG. 6. Cross-section through fertile part of an unusually narrow leaf.

FIGS. 7 and 8. Cross-sections through petiole more than 2 mm. above stem.

FIG. 9. Cross-section through petiole very close to stem, and before simple leaf-trace has divided.

FIG. 10. Stem scale.

FIG. 11. Petiole scale.

Specimens figured: figures 1–4, *H. H. Smith 1112* (in National Herbarium), Colombia; 5, 11, *Moritz 143*, Tovar, Venezuela (type 6–10, *Sodiro*, Ecuador).

PLATE 20. VITTARIA WILLIAMSII Benedict

FIG. 1. Single leaf, showing soriation and the extreme of length noted.

FIG. 2. Whole plant (*type*), showing general habit, venation, and soriation.

FIG. 3. Cross-section of half of leaf in fertile part, showing very slight depression where sporangia are borne.

FIG. 4. Cross-section through leaf below fertile part.

FIG. 5. Cross-section through petiole more than 2 mm. above stem.

FIG. 6. Scale showing the very heavily thickened apical portion.

Specimens figured: figure 1, *Rusby 339*, Yungas, Bolivia; 2–6, all from type material.

The ferns and flowering plants of Nantucket—XIII

EUGENE P. BICKNELL

CLETHRACEAE

CLETHRA ALNIFOLIA L.

Abundant in low thickets and about the borders of ponds and pools. Flower buds in close green spikes July 14, 1912; some flowers remaining Sept. 14, 1907.

PYROLACEAE

PYROLA AMERICANA Sweet.

Not common, but widely scattered on the island in dry thickets, less often in open ground. Racemes of close buds June 15, 1911; precocious flowers in an open sunny spot June 23, 1910; first flowers July 2, 1912.

PYROLA CHLORANTHA Sw.

Found here and there in scattered colonies through the pine woods near the County Fair grounds and in open ground beyond towards the north, also still farther on among pines along the Wauwinet road; a few stunted plants among bearberry in open ground on Saul's Hills. Flower buds June 5, 1911; in full flower June 17, 1908, June 18, 1910; past flowering July 9, 1912.

CHIMAPHILA MACULATA (L.) Pursh.

In pine woodland; common and of large size east of Hummock Pond and found locally eastward to the County Fair grounds. Flower buds ready to open July 9, 1912.

CHIMAPHILA UMBELLATA (L.) Nutt.

Not more common than the preceding and often growing with it but of freer range and occasionally met with on the open commons, as in the North Pasture and above the "Cliff" near "Monsalvat." Just in flower July 9, 1912.

MONOTROPACEAE

MONOTROPA UNIFLORA L.

Frequent in pine woodland; under beeches in Quaise; occasional on the open commons pushing up through the thick carpeting of bearberry. Not seen farther east than Quaise, nor west of Hummock Pond; observed in full flower from early August until late in September. On Marthas Vineyard I have seen it in flower as early as June 28. Plant often tinged with clear pink.

* HYPOPITYS AMERICANA (DC.) Small.

Pine woods towards Surfside, Sept. 8, 1904, passing out of bloom. Determined by Doctor Small. Plant pale and yellowish throughout, thinly short-pubescent, the stigma not bearded. I do not myself well understand this species, never having met with it in perfect flowering condition, but the characters adduced by Doctor Small appear to be distinctive.

HYPOPITYS LANUGINOSA (Michx.) Nutt.

Common locally among the pines east of Hummock Pond; Miacomet Pines; pine grove on Surfside road. Pale yellowish throughout, or the stems, especially basally, tinged with light yellowish pink; lanate-pubescent, the stigma retrorse-bearded. In full flower Aug. 9, 1906, the largest plants 4 dm. high; mostly past flowering Sept. 16, 1907. Inflorescence occasionally compound. The flowering period appears to be considerably earlier than that of *H. americana*.

Both of these plants occur in pine woods on Marthas Vineyard where, also, in deciduous woodland, there is yet a third species, smaller and later-flowering, and conspicuous by reason of its vivid red color, the shade varying from clear pink to carmine and almost scarlet. Other characters combine with size and color to mark it a distinct species. Its pubescence is short and close and the stigma densely white-bearded; its capsule is small, 4–5 mm. long, and ovoid to nearly globose. Its late flowering period is noteworthy. On Chappaquiddick Island, as late in the season as October 5, 1912, it was only just coming into bloom. On Long Island, where *H. lanuginosa* blooms in July and early in August, this red species is not seen at all until about the middle of September. I have not met with it on Nantucket, but it would

seem to be altogether probable that it is to be found there late in the season.

Specimens from Chappaquiddick Island, Marthas Vineyard, Oct. 5, 1912, have been deposited as the type in the herbarium of the New York Botanical Garden named **Hypopitys insignata** sp. nov.

ERICACEAE

AZALEA VISCOSA L.

Everywhere in swamps and bogs. First flowers June 17, 1910, June 18, 1908; mostly not yet in bloom June 17, 1912, generally in bloom July 10; some flowers in mid-September, 1907.

In a number of instances it was observed that corollas with long tube and short limb were pure white and that those with shorter tube and broad limb were often deeply tinged with pink. The pink-flowered shrubs seemed to be, as a rule, earlier flowering and, at least in the most pronounced examples, had rather coarsely bristly-ciliate pedicels, and acute leaves, somewhat pale beneath, thus corresponding with Pursh's description of his *Azalea hispida*.

AZALEA NITIDA Pursh.

Occasional or frequent in bogs and wet thickets; Polpis, Quaise, Tom Never's swamp, below the "Cliff." In full flower Aug. 4, 1906. Leaves numerous and crowded, small, 2–2.5 cm. long and 5–10 mm. wide, coriaceous and very acute, dark green and shining on both sides, especially above. A very different shrub in conformation and aspect from the more openly branched and larger leaved *A. viscosa*, yet quite obviously intergrading with it.

* AZALEA GLAUCA Lam. Encyc. 1: 340. 1783.

Frequent; Quaise, Polpis, Tom Never's Swamp, Millbrook Swamp, Trot's Swamp. A beautiful and always strikingly individualized shrub. Neither on Nantucket nor on Long Island have I seen any convincing evidence that it blends with *A. viscosa*, although it may well be true that interbreeding tends to keep it within the organic influence of that species.

KALMIA LATIFOLIA L.

Mrs. Owen's catalogue preserves the record of "a single dwarf specimen not more than a foot high" found by Mr. Dame on the plains opposite Bloomingdale.

KALMIA ANGUSTIFOLIA L.

Common in moist levels about sphagnum bogs and also entering freely into the low woody growth of dry level tracts in low grounds or on the moorland. First flowers June 7, 1908; June 10, 1911, and generally coming into bloom June 15; June 12, 1909; still in flower July 13, 1912. Not rarely a few flowers open in the autumn, even late in September.

XOLISMA LIGUSTRINA (L.) Britton.

Abundant in low grounds either in moist or in drier soils. First flowers July 1, 1912, in full flower generally by July 4.

This is one of the strong and rigidly branched shrubs that especially combine with the high bush blueberry to give resistance and impenetrability to the Nantucket swampy thickets. It mixes also with the Azaleas, Aronias and Amelanchiers, *Clethra alnifolia*, *Ilex fastigiata*, and other less abundant species that make up the dense thickety growths that invest many of the ponds and pools.

CHAMAEDAPHNE CALYCULATA (L.) Moench.

Locally common in very wet bogs. Still in flower May 31, 1909; only dried corollas remaining June 3, 1911.

EPIGAEA REPENS L.

On Nantucket, contrary to its usual habits, the trailing arbutus favors less the seclusion of woodland or pine groves than the exposure of open barrens where the sun beats upon it all through the season contracting its growth into little compact mats flattened upon the sandy soil. It even grows tenaciously on the bare tops of the rolling hills, and is common over the plains on the south side of the island, in some places extending quite to the edge of the low bank along the ocean shore.

I have never been on Nantucket early enough in the spring to see it in bloom, but in the deep shade of the Miacomet pines, on June 3, 1909, the dried corollas were not yet all fallen away.

GAULTHERIA PROCUMBENS L.

Locally very common on heaths and dry level tracts among low trees and shrubbery, sometimes in moister soil at the borders of sphagnum bogs. Ripe fruit in September, 1899, and fruit still persistent June 1, 1909.

ARCTOSTAPHYLOS UVA-URSI (L.) Spreng.

The bearberry is probably the most abundant flowering plant on Nantucket, where it spreads a thick evergreen carpet over unnumbered acres of the rolling commons and of hill and plain. Throughout wide tracts not a point of ground is left uncovered by its even mantle of firm shining foliage, which makes a clean and springy footway, and on slopes and hillsides a very slippery one. The long trailing stems and branches weave so strong in interlacement that many kinds of plants that would thrive well upon the same soil are either choked away or find no spot whereon to begin their growth. Nevertheless the close abundance of the bearberry often gives good protection to many another plant in a most unexpected way. Beneath its low covering the soil is ever in shade and remains cool and damp under the hottest sun. By this are some woodland species afforded conditions which enable them to exist far out on the dry barrens, and growing up out of the bearberry comes many an unexpected thing. The Indian pipe is occasionally to be seen pushing up through its close fretwork as well as *Pyrola americana*, *Pyrola chlorantha*, *Chimaphila umbellata*, *Cypripedium acaule*, probably all plants of acid soils, and *Vagnera stellata*, *Linum intercursum*, *Grossularia hirtella*, and other species, including some of the grasses natural to the damp soil of low grounds.

The bearberry was everywhere in full flower June 1, 1909. In other years it had passed out of bloom either before or soon after the middle of the month; green fruit June 7, 1908, and some becoming red June 18; in 1912 the fruit had only begun to redden June 30; abundant fruit in September, 1899.

CALLUNA VULGARIS (L.) Salisb.

The late lamented Mrs. Owen* in a most interesting paper, one of the latest from her always agreeable pen, on "The Adventive Heaths of Nantucket" (Rhodora, **10**: 173–179. O 1908) has given us a history of the three heaths that are found growing wild on the island. We are told that the *Calluna*, or ling, was first found on Nantucket in 1880 by Mr. Lawrence Coffin, a single plant on the open commons, which persisted for many years and

* Maria Louisa (Tallant) Owen. Born on Nantucket in 1825. Died June 8, 1913.

finally disappeared. This is the only plant of *Calluna* ever found on the island whose presence there remained to Mrs. Owen altogether unexplained. At the place where in this day the heather principally grows it came in with trees imported from Europe by Mr. Henry Coffin in 1877 and subsequent years, and was first found by Mr. Lawrence Coffin in 1886, then well established. Since that time it has been sought to naturalize the heather on the island by several persons who have scattered the imported seed and even set out young plants.

The earliest record known to me of *Calluna vulgaris* on Nantucket, as well as of the cross-leaved heath, *Erica Tetralix*, was published by Mr. O. R. Willis in the Bulletin of the Torrey Botanical Club for December, 1886; the plants had been found the same year by Mrs. Charlotte E. Pearson in a tract planted with larches imported from Europe.

Mrs. Owen has mentioned half a dozen localities other than this now well-known one, where this heather has been found, at three of which, two of them far out on the commons, it is not known to have been planted. I, myself, have met with it at five localities, all of them mentioned by Mrs. Owen except perhaps one on the plains in the direction of the old Kimball farm where, on June 3, 1909, a solitary cluster was growing which measured 28 inches in greatest diameter.

At the place where this heather was first introduced I came upon it quite accidentally on Aug. 9, 1906, when, with the cross-leaved heath, it was in full flower. Since that time it has continued to spread, and of late years has become well naturalized in scattered growth among the pines. In 1908 the main growth covered a general area of 17 by 14 paces, made up of straggling groups, small separate clusters, and several masses of considerable size. In 1911 it seemed to be more abundant than I had seen it at any time before, but in July of the following year, after the intervening cold but not snowy winter, much of it had been winter-killed, at least its upper parts. It showed no signs of flowering on July 3, 1909, nor on July 17, 1908; on July 26, 1910, no buds could be found on the wild plant but one in cultivation in a garden in the town bore long racemes of pink buds. The wild plant was in full flower August 9, 1906, August 10, 1895 (F. G. F), and bore some fresh flowers September 18, 1897.

I have elsewhere reported* that the common heather, so well established on Nantucket at the locality where it was first introduced, is not the typical glabrate form of the species but is the pubescent form, var. *pubescens* Koch. As I have observed it, this is a neater appearing and more attractive plant than the glabrous type and by contrast of appearance a very different one. The heather found on Marthas Vineyard is, on the contrary, the typical glabrate plant. It is an interesting fact that this form occurs on Nantucket also, but at a locality remote from that where the pubescent form is found. The single cluster already referred to as growing not very far from the Kimball farm was of the glabrate form, and an old specimen in the Columbia University herbarium bearing no other record than "Nantucket" is the same. Another old specimen in this herbarium, presumably of the same period, is of the pubescent form. It was collected by Mrs. Pearson twenty-seven years ago, in 1886, and was from the same locality where the pubescent plant is found today. The occurrence of both forms on Nantucket at the period of its early discovery there would appear to indicate that the island had received this addition to its flora not alone from its chance introduction with trees imported from Europe but also through some other channel which remains quite unknown.

ERICA TETRALIX L.

It is related of the cross-leaved heath by Mrs. Owen (loc. cit.) that it, also, was introduced with the imported pines that brought the *Calluna* and was first observed on Nantucket in 1884 by Miss Susan Coffin. Mr. Willis, in his note already cited, has recorded that, in 1886, Mr. Henry Coffin made a thorough search of the tract where this heath had been found the same year by Mrs. Pearson and discovered twenty patches of the *Erica*, which "was as abundant among the firs [pines] brought from Illinois as among the larches from England." The cross-leaved heath appears to have been found on Nantucket nowhere else than at this locality. In 1911 it was fairly common there, well scattered among the clusters of *Calluna* and evidently perfectly naturalized. The following season, like the *Calluna*, much of it had been winter-killed and no flowers were to be found as late as July 12. In 1909

* Rhodora, 15: 189–192. N 1913.

no flower buds had appeared by June 12, but some of the stem tips bore little terminal rosettes showing where the buds were coming; buds visible June 11, 1911; first flowers June 17, 1908; in full flower August 9, 1906, August 10, 1895 (F. G. F.); a single cluster of pink buds September 18, 1907.

ERICA CINERA L.

In Alphonso Woods's "Botanist and Florist," edition of 1871, it is recorded that this heath, the bell heather, was discovered on Nantucket in June 1868, by Mrs. E. E. Atwater. Mrs. Owen's paper, already cited, tells us that only a solitary plant was found, that it was found again in 1871, and was rediscovered independently by Mrs. William A. Spinney in 1878. It lived until 1902 or 1903. Shortly before this a second plant was found not far off, and a year or two after, yet a third plant was discovered nearby. These facts, taken by themselves, would seem to make it perfectly obvious that the two later plants had been derived from the older one by self-sown seed. But the evidence gathered by Mrs. Owen puts this in some doubt, for it is known that heather plants of some kind were at one time set out somewhere in the same part of the island where these plants were found.

Mr. Willis in his note, published in 1886* reported that Mrs. Charlotte C. Pearson in September of that year sent him a specimen of *Erica cinerea* from a new locality and stated that the plant had been found in four different places on the island far apart, and that she had found it when a child in a locality far from dwellings and where trees had never been known to grow.

On June 23, 1911, Mr. John Appleton took me to the locality where this heath is said to have grown since 1868. There we found one bushy plant covered with flower buds, some of them pink and on the point of opening. The spot was among an open growth of pines, part of an extensive and much denser tract, and the plant was well concealed from every side a few yards away. Many a time I had passed close to it without making the discovery. The year after this it had disappeared, and I was told that, in order to protect it from extermination by visitors it had been transplanted to private grounds where, at the middle of July, it was beginning to show signs of life. I have to thank Mrs. Albertson for a

* Loc. cit.

fragment of this heather collected July 6, 1909, then just in flower. In flower September 3, 1902, F. G. Floyd.

VACCINIACEAE

GAYLUSSACIA BACCATA (Wang.) C. Koch.

Abundant in dry thickets and open ground. In full flower May 30, 1909, June 15, 1911; green fruit June 18, 1910; first ripe fruit July 14, 1912.

Although a low and inconspicuous shrub this huckleberry has much to do with giving character to parts of the Nantucket landscape. Here it is less a plant of woods and thickets than of open ground, where its habit is to mass itself into extensive growths, for the most part unmixed with any other species. Thus outspread along the hills in distant view its foliage blends into breadths of brassy or golden green in effective contrast with the more sombre tones of color spread in broad patchwork about it. The gray green of scrub-oak thickets, the dark olive of the widespread bearberry, the varied neutral shades of other low-growing vegetation all go to make up a composition in which the livelier green of this huckleberry gives the stronger contrasts and dominating note.

GAYLUSSACIA FRONDOSA (L.) T. & G.

Locally common, mainly on the eastern side of the island, keeping in and about thickets and never straying into the open like the preceding. Not yet in flower June 12, 1909; first flowers June 10, 1911; in full bloom June 20, 1910; some flowers remaining July 4, 1912. On Chappaquiddick Island I have found it bearing abundant fruit in the second week of October.

GAYLUSSACIA DUMOSA (Andr.) T. & G.

Locally common in low grounds on the eastern side of the island; cranberry bogs about Long Pond on the western side. In full flower June 11, 1908, in Quaise; just in flower June 22, 1910, Long Pond; July 2, 1912, Tom Never's Swamp; abundant fruit Sept. 15, 1907.

The Nantucket plant, or much of it, is typical of the form called by Doctor Fernald var. *Bigeloviana*.

VACCINIUM VACILLANS Kalm.

Common among the low woody growth of hillsides and dry open places. In full flower June 5, 1911; still some flowers June 29, 1908, June 30, 1910; ripe fruit July 11, 1912.

The common form has the leaves either entire or serrulate, and nearly or quite glabrous, varying from pale and glaucous to merely glaucescent, the branches often slightly puberulent. A taller form with larger and somewhat pubescent, pointed leaves, and soft pubescent branchlets, may be a cross with *Vaccinium corymbosum*. It was found only in a bushy tract on the plains west of the railroad at about the third milestone.

VACCINIUM ANGUSTIFOLIUM Ait.

V. pennsylvanicum Lam., not Mill.

Abundant in dry open places and among open growths of low shrubbery. In full flower May 30, 1909, June 3, 1911; not many flowers left June 7, 1908; first ripe fruit June 7, 1912.

Diminutive forms, sometimes only a few inches high, have very small and crowded oblong-lanceolate leaves narrowly tapering to the base and the very acute apex. Other forms have larger oval or elliptic less pointed leaves. The Nantucket plant seems to be never strictly glabrous, the branchlets and the midvein of the leaf, at least on its upper side, showing more or less pubescence.

Growing with the common form near Tom Never's Head and west of the railroad at about the third milestone occurs var. *nigrum* Wood, having dark green shining leaves and large black fruit either wholly without glaucescence or with the bloom so faint as to be barely perceptible.

* **Vaccinium Brittonii** Porter, sp. nov.

Vaccinium nigrum Britton, Man. 710. 1901. Not *V. nigrum* (Wood) Britton, Mem. Torrey Club 5: 252. 1894.

Low, 1–4 dm. high, from stout horizontal or ascending rootstocks; stems clustered, the branches often fastigiate; bark pale green or violaceous, the shoots white glaucous; branchlets usually with traces of puberulence; leaves numerous, often crowded, oval to elliptic, obtuse or pointed, 1.5–3 cm. long, 7–12 mm. wide, or larger on the season's shoots, pale bluish green and glaucous

or glaucescent, often whitened beneath, firm and cartilaginous-serrulate, the venation prominent, especially on the lower surface, glabrous, or puberulent on the midvein on the upper side; corolla cylindric-urceolate, about 6 mm. long; calyx lobes commonly larger and more venose than those of *V. angustifolium;* fruit glaucous at least when young, becoming dark.

Type from Nantucket, Tom Never's swamp, June 13, 1908.

The *Vaccinium pennsylvanicum* var. *nigrum* Wood was described as "Dark green, berries black and shining without bloom" (Bot. and Fl. 199. 1873). The reference is unmistakably to the black-fruited form of *V. angustifolium*, which is not a very uncommon plant and, when in mature fruit, is at sharp contrast with the common blue-fruited form with which it grows. *Vaccinium Brittonii*, which is characteristically pale green and glaucescent, is altogether a different plant. This was seen long ago by the late Doctor Thomas C. Porter, and the name here adopted for it was proposed by him in a letter to Doctor Britton dated Feb. 25, 1891, now preserved in the herbarium of Columbia University. This letter is attached to a sheet bearing two separate collections of the plant, one by Doctor Britton from High Point, Sussex County, New Jersey, May 30, 1891, the other, by Mr. O. A. Farwell, from sand dunes along the shore of Lake Superior in Keweenaw County, Michigan, Aug., 1890. There appears to be no specimen collected by Doctor Porter or designated by him, but his letter is perfectly clear in pointing out the characters that distinguish this blueberry from *V. angustifolium*, which he discusses under the then current name of *V. pennsylvanicum*. On Nantucket *Vaccinium Brittonii* was met with only in Tom Never's swamp where it grows in several places in association with *Cassandra*, *Gaylussacia dumosa*, *Aronia nigra*, and also *Vaccinium angustifolium*. Last flowers June 13, 1908; green glaucous fruit July 2, 1912.

At the Thousand Islands, in 1905, I found it a representative species, particularly on La Rue Island, where it was in fruit late in August. The pale green color of the firm oval leaves and the white glaucous leafy shoots distinguished it strikingly from *V. angustifolium* and *V. canadense*, also common there. The mature fruit although very dark was covered with a faint glaucous bloom.

It seems appropriate here to report an evident hybrid between

V. angustifolium and *V. vacillans* that might readily be mistaken for *V. Brittonii*. It was collected on Long Island, east of Smithtown, Aug. 1, 1908, a single plant growing with an abundance of both the others, and appearing quite intermediate between them except in respect of the fruit, which was very dark, having only the faintest glaucescence. In other respects it differs from *V. Brittonii* in larger and relatively broader leaves of thinner texture, which are elliptic to obovate, mostly 3–3.5 cm. long and 1.5 cm. wide, distinctly pointed, not obviously paler beneath, and closely ciliate-serrulate.

Since this was written I have seen in the herbarium of the New York Botanical Garden a specimen of *Vaccinium Dobbini* Burnham from Jackson, Washington County, New York, (Am. Bot. 12: 8. 1907). It is in all respects the same as the Long Island hybrid and, like the latter, was found growing with both the parent species.

*** Vaccinium atlanticum** sp. nov.

A compact, often rounded shrub, commonly 6–9 dm. high, often close branched and leafy from the base; branches greenish, verrucose-puncticulate, glabrous or minutely crisp-puberulent in lines, branchlets more or less pubescent when young; leaves rather close and numerous, small for a high bush blueberry, 3–5 cm. long, 1–2 cm. wide, or larger on the shoots, oblong- to elliptic-lanceolate, gradually narrowed to base and apex, acute, often attenuate, ciliolate-serrulate, dark green and more or less shining above, paler beneath, the midvein pubescent with spreading hairs, at least towards the base on the lower side, rarely quite glabrous; flowers opening with the unfolding leaves; inflorescence of short racemes clustered towards the ends of the branches or lateral; pedicels slender; corolla broadly cylindraceous to openly urceolate, the widest part often above the middle or towards the throat, angulate, 6–8 mm. long, 4–5 mm. wide, white or pink-tinged, calyx lobes round to triangular and subacute; fruit dark blue, glaucous, becoming 9 mm. in diameter, sweet.

Rather common on Nantucket about the borders of low thickets or in open low grounds. Type, flowering, Millbrook Swamp, May 31, 1909; fruiting, Pocomo, July 11, 1912, deposited in the herbarium of the New York Botanical Garden. Also collected on Chappaquiddick Island, Marthas Vineyard, and at Lake Ronkonkoma, Long Island.

This is perhaps the blueberry reported by Mr. Kenneth K. Mackenzie from New Jersey and Staten Island as *Vaccinium virgatum* Ait. (Torreya 7: 144–145. 1909). Certain New Jersey specimens so named in the herbarium of the New York Botanical Garden agree closely with the Nantucket plant. They do, indeed, convey a suggestion of *V. virgatum*, but I have seen no northern *Vaccinium* that I could deem as at all referable to the plant of the Southern States taken up under Aiton's name, none, for instance that showed the same naked and virgate inflorescence, or the cylindric-conic corolla, or the characteristic brown stipitate glands on the lower surface of the leaf. *Vaccinium atlanticum* is evidently in closer relationship with *V. corymbosum*, differing obviously however by lower stature, more compact habit, and smaller and narrower leaves dark shining green above and ciliolate-serrulate on the margins. In the aspect of this blueberry there is something both of *V. corymbosum* and *V. angustifolium*, and were only a single example known it might well be supposed to be a hybrid of these species. It appears to have, however, a perfectly natural coastwise range of considerable extent, and I have observed nothing in the manner of its occurrence on Nantucket to lead me to believe that it is not in itself a valid species.

It is scarcely probable that this blueberry has not been frequently collected and, if so, it has perhaps been referred to the *V. corymbosum* var. *amoenum* of Gray (*V. amoenum* Ait.), which is described as differing from *V. corymbosum* by bristly ciliate leaves bright green on both sides. I have never met with any high bush blueberry having just such leaves except one herein presently to be described as a possible hybrid between *V. corymbosum* and *V. angustifolium*. But I find no warrant in Aiton's description of his *V. amoenum* for thus understanding the shrub he sought to define, which he denominated the broad-leaved whortleberry and characterized as having leaves pubescent on the veins beneath and only subserrulate. A blueberry having just such leaves is not uncommon. It is an openly branched shrub, mainly of low shaded woodland, the leaves of which are more or less obscurely serrulate or some of them entire and which has claims to recognition, although perhaps passing into the ordinary *V. corymbosum* of more open grounds.

VACCINIUM CORYMBOSUM L.

An abundant shrub, mainly of low grounds, where it mixes with other shrubbery or groups itself into close thickets that form impassable barriers about pools and swampy spots. In full flower May 31, 1909; no flowers left June 5, 1910; first ripe fruit July 4, 1912.

* VACCINIUM ANGUSTIFOLIUM × CORYMBOSUM?

A very distinct appearing blueberry midway in size between the high bush and the low bush series, having bright green serrulate leaves, broadened like those of *V. corymbosum*, with the membranous and lucid character of those of *V. angustifolium*, and further noteworthy by reason of puberulent pedicels and ciliolate calyx lobes.

From 5 to 9 dm. high; leaves ovate to elliptic, acute, mostly 4 cm. long by 2 cm. wide, the largest 5.3 × 2.7 cm., firm and membranous, ciliolate, and bristly serrulate, on both sides bright green and shining, strictly glabrous beneath, the upper face puberulent along the principal veins; branches green, verrucose, puberulent; inflorescence mostly compound, consisting of short racemes or corymbiform clusters along naked terminal branchlets; fruit large, becoming 1 cm. in diameter, depressed-globose, deep blackish blue with a bloom; pedicels mostly curved, about 5 mm. long, crisp-puberulent; calyx lobes tomentulose-ciliolate.

On Coatue, near Third Point, July 13, 1912, a single colony. Specimens deposited in the herbarium of the New York Botanical Garden.

If not a hybrid I do not see how this plant is to be accounted for except as a hitherto unrecognized species. Its membranous leaves bright shining green on both surfaces keep it sharply apart from all of the *corymbosum* series and seem to place it in relationship with *V. angustifolium*, but in size and habit and in breadth of leaf it is more of a high bush blueberry, appearing, indeed, quite intermediate between *V. angustifolium* and *V. corymbosum*. The puberulence of the pedicels is a character not shared with any northern species of the *corymbosum* group, although more or less evident on many examples of *V. angustifolium;* in the latter, also, obscurely ciliolate calyx lobes are sometimes seen.

* VACCINIUM AUSTRALE Small.

V. corymbosum var. *glabrum* A. Gray, Man. ed. 5, 292. 1867.

V. caesariense Mackenzie, Torreya **10**: 230. 1910.

Common in low thickets. In full flower June 1, 1909; June 8, 1910; corolla broadly cylindric, variable in size, becoming 8–9 mm. long and 5–7 mm. wide, sometimes considerably smaller; ripe fruit Aug. 6, 1906, Aug. 9, 1908; berry blue and very glaucous, becoming as large as a half inch in diameter.

The handsomest of our high bush blueberries. In its typical form the thick entire leaves, bright green above and often glaucescent, are whitened on the lower surface, and are wholly glabrous even in vernation, except sometimes for a minute pubescence along the midvein on the upper face. Quite possibly intergrades or hybridizes with *V. corymbosum*.

VACCINIUM ATROCOCCUM (A. Gray) Heller.

Common in the dense thickets of low grounds, often associating with *V. corymbosum*. Last flowers, and young fruit, June 10, 1908; some ripe fruit July 11, 1912.

At Coskaty on Aug. 14, 1906, a form was collected bearing the characteristic dark shining fruit, but with the leaves very acute and more or less serrulate, or some of them entire, thus answering to Michaux's description of his *V. disomorphum*. Bigelow, long ago (Fl. Bost. ed. 2, 151. 1824) correlated this name with the shrub we now call *V. atrococcum*, and it comes out pretty clearly that his judgment was correct, unless a distinction is to be discovered between those shrubs having strictly entire leaves and those with the leaves subserrulate or sometimes entire as Michaux described them. His Latin, "*folia . . . subtus pubentia, interdum integriuscula . . . corolla albido-purpurascens, oblonga, ovoideo-urceolata*" quite definitely excludes *V. corymbosum* as well as all other northern species at present recognized, except *V. atrococcum*.

* **Vaccinium vicinum** sp. nov.

Characterized by a close soft pubescence, similar to that of *V. atrococcum*, and large flowers as well as glaucous fruit, more like that of *V. corymbosum;* the leaves, more or less serrulate, but often entire, are commonly narrower than in either of those species and of marked oblanceolate or obovate-oblong tendency.

An openly branched shrub 1–2 m. or more high; branchlets and young leaves beneath tomentulose-canescent or villous-

tomentulose with a white pubescence; mature leaves thick; villous-pubescent on the pale lower surface, becoming tawny in age, bright green and shining and usually thinly pubescent on the upper surface, entire or serrulate even on the same branch, firm, oblanceolate, long-tapering to the base and tapering-acute at apex to obovate-oblong or elliptic and acuminate, often 5–6 cm. long by 1.5–2 cm. wide, sometimes oblong-ovate and 2.5 cm. wide; flowers appearing with the leaves, disposed in numerous close clusters along the leafless or leafy terminations of the branches or scattered on lateral branchlets; corolla white, broadly cylindric, 8–10 mm. long, 4–5.5 mm. wide; fruit blue-glaucous, dark beneath the bloom.

Frequent on Nantucket and on Long Island in low grounds. Type from Nantucket, Trot's Swamp, July 3, 1912, young fruit; in flower, near Maxcy's Pond, May 30, 1909; deposited in the herbarium New York Botanical Garden.

It might be thought that this blueberry was a cross between *V. atrococcum* and *V. corymbosum* were it not that the flowers do not show any intermediate character and that the leaves are commonly narrower and more tapering towards base and apex than in either. It is evidently closely related to *V. corymbosum* and approaches *V. fuscatum* Ait. of the Southern States, described as fuscous-pubescent and with entire leaves.

CHIOGENES HISPIDULA (L.) T. & G.

Very local, on the eastern side of the island. Abundant in a sphagnum bog east of Almanac Pond, growing with the small cranberry and the pitcher plant. I have not myself seen it at any other station, but it is said to grow in other sphagnum bogs in the same neighborhood. Berries half grown June 11, 1909.

OXYCOCCUS OXYCOCCOS (L.) MacM.

Locally abundant in cold sphagnum bogs: Long Pond; Hummock Pond; Abrams Point bog; Quaise; Pocomo; Sachacha Pond. Blooms rather earlier than the common cranberry. Just in flower June 2, 1909; June 9, 1911; June 11, 1908; in full flower July 6, 1912.

OXYCOCCUS MACROCARPUS (Ait.) Pers.

One of the abundant native plants of Nantucket, thriving in sandy bogs and on the level shores of fresh water ponds. Now also

extensively cultivated, many sandy swamps and acres of low ground having been transformed into cranberry bogs. Just in flower June 17, 1908; in full flower June 15, 1910; July 5, 1912.

A smaller and more delicate form occurs, having narrower linear-oblong leaves, only 5–10 mm. long by 2–3 mm. wide, the inflorescence frequently terminal, and the corolla segments only 5.9 mm. long.

INDEX TO AMERICAN BOTANICAL LITERATURE

1914

The aim of this Index is to include all current botanical literature written by Americans, published in America, or based upon American material; the word America being used in the broadest sense.

Reviews, and papers that relate exclusively to forestry, agriculture, horticulture, manufactured products of vegetable origin, or laboratory methods are not included, and no attempt is made to index the literature of bacteriology. An occasional exception is made in favor of some paper appearing in an American periodical which is devoted wholly to botany. Reprints are not mentioned unless they differ from the original in some important particular. If users of the Index will call the attention of the editor to errors or omissions, their kindness will be appreciated.

This Index is reprinted monthly on cards, and furnished in this form to subscribers at the rate of one cent for each card. Selections of cards are not permitted; each subscriber must take all cards published during the term of his subscription. Correspondence relating to the card issue should be addressed to the Treasurer of the Torrey Botanical Club.

Ames, O. The orchids of Guam. Philip. Jour. Sci. **9**: (Bot.) 11–16. F 1914.

Includes eight new species.

Atwood, W. M. A physiological study of the germination of *Avena fatua*. Bot. Gaz. **57**: 386–414. *f. 1–13*. 16 My 1914.

Bicknell, E. P. Some grasses noteworthy in Massachusetts. Rhodora **16**: 81–83. 11 My 1914.

Brand, A. Symplocaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 172. 4 Ap 1914.

Includes *Symplocos Ulei* sp. nov.

Brause, G. Polypodiaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 109–111. 20 Mr 1914.

Includes *Polypodium roraimense* and *Dryopteris roraimensis*, spp. nov.

Clements, F. E., & Clements, E. S. Rocky Mountain flowers. i–xxxi + 1–392. *pl. 1–47*. White Plains, 1914.

Cook, M. T. Crown gall and hairy root. New Jersey Agr. Exp. Sta. Circ. 34: 1–14. [1914.] [Illust.]

Cook, M. T. Potato diseases in New Jersey. New Jersey Agr. Exp. Sta. Circ. 33: 1–24. *f. 1–14*. [1914.]

Cook, M. T. Some diseases of nursery stock. New Jersey Agr. Exp. Sta. Circ. 35: 1–24. *f. 1–15.* [1914.]

Copeland, E. B. New Papuan ferns. Philip. Jour. Sci. **9**: (Bot.) 1–9. F 1914.

Includes new species in *Cyathea* (2), *Dryopteris* (4), *Tectaria* (2), *Athyrium* (1), *Adiantum* (1), *Polypodium* (6), and *Aglaomorpha* (1).

Cotton, A. D. The genus *Atichia*. Kew Bull. Misc. Inf. **1914**: 54–63. *f. 1.* Mr 1914.

Cross, E. R. *Viola Selkirkii* in Colorado. Rhodora **16**: 94, 95. 11 My 1914.

Dachnowski, A., & Gormley, R. The physiological water requirement and the growth of plants in glycocoll solutions. Am. Jour. Bot. **1**: 174–185. 23 My 1914.

Diels, L. Droseraceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 136. 20 Mr 1914.

Diels, L. Menispermaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 132–134. 20 Mr 1914.

Includes *Anomospermum chloranthum* and *Odontocarya floribunda*, spp. nov.

Engler, A., & Krause, K. Araceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 113–117. 20 Mr 1914.

Includes *Anthurium micranthum* Krause, *Stenospermatium Ulei* Krause, *Monstera acreana* Krause, *Dracontium Ulei* Krause, *Xanthosoma Hylaeae* Engl. et Krause, and *Taccarum Ulei* Engl. et Krause.

Evans, A. W. Hepaticae: Yale Peruvian Expedition of 1911. Trans. Connecticut Acad. Arts & Sci. **18**: 295–345. Ap 1914.

Includes *Metzgeria scyphigera*, *Plagiochila Binghamiae*, *P. Footei*, *P. pauciramea P. striolata*, and *Dicranolejeunea rotundata*, spp. nov.

Farrell, M. E. The ovary and embryo of *Cyrtanthus sanguineus*. Bot. Gaz. **57**: 428–436. *pl. 24* + *f. 1–3.* 16 My 1914.

Fernald, M. L. Three lupines naturalized in eastern Canada and Newfoundland. Rhodora **16**: 92–94. 11 My 1914.

Graves, A. H. The future of the chestnut tree in North America. Pop. Sci. Mo. **84**: 551–566. *f. 1–4.* Je 1914.

Harms, H. Araliaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 167, 168. 4 Ap 1914.

Includes *Didymopanax psilophyllus* sp. nov.

Harper, R. M. The "Pocosin" of Pike County, Alabama, and its bearing on certain problems of succession. Bull. Torrey Club **41**: 209–220. *f. 1–4.* 13 My 1914.

Harris, J. A. On the relationship between the number of ovules formed and the number of seeds developing in *Cercis.* Bull. Torrey Club **41**: 243–256. *f. 1–3.* 13 My 1914.

Heimerl, A. Nyctaginaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 126–132. 20 Mr 1914.

Includes four new species in *Neea.*

Higgins, B. B. Contribution to the life history and physiology of *Cylindrosporium* on stone fruits. Am. Jour. Bot. **1**: 145–173. *pl. 13–16.* 23 My 1914.

Includes *Coccomyces prunophorae* and *C. lutescens,* spp. nov.

Howe, M. A. The marine algae of Peru. Science II. **39**: 254. 13 F 1914.

Humphrey, L. E. The honeysuckle family in Ohio. Ohio Nat. **16**: 299–308. 24 Ap 1914.

Knowlton, C. H. *Spiraea salicifolia* in Alburg, Vermont. Rhodora **16**: 96. 11 My 1914.

Krause, K. Rutaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 143–149. 4 Ap 1914.

Includes one new species each in *Fagara, Galipea, Rauia, Erythrochiton,* and *Metrodorea,* and *Sohnreyia excelsa* gen. et sp. nov.

Krause, K. Sapotaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 169–172. 4 Ap 1914.

Includes one new species each in *Lucuma, Bumelia, Vitellaria,* and *Chrysophyllum.*

Lipman, C. B. The poor nitrifying power of soils a possible cause of "die-back" (exanthema) in lemons. Science II. **39**: 728–730. 15 My 1914.

MacDougal, D. T. The measurement of environic factors and their biologic effects. Pop. Sci. Mo. **84**: 417–433. *f. 1–8.* My 1914.

MacDougal, D. T. The auxo-thermal integration of climatic complexes. Am. Jour. Bot. **1**: 186–193. *pl. 17, 18.* 23 My 1914.

Malme, G. Xyridaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 117–119. 20 Mr 1914.

Includes *Xyris Roraimae* Malme.

Mansfield, W. Poisonous plants. Practical Druggist **31**: 24, 25. 15 O 1913; **31**: 25, 26. 15 N 1913; **31**: 26, 27. 15 D 1913; **32**:12, 13. 15 Ja 1914; **32**: 58, 59. 15 F 1914. [Illust.]

Melchers, L. E. A preliminary report on raspberry curl or yellows. Ohio Nat. **14**: 281–288. *f. 1–5*. 24 Ap 1914.

Morse, W. J. Powdery scab of potatoes. Maine Agr. Exp. Sta. Bull. 227: 89–104. *f. 44–52*. Mr 1914.

Perkins, J. Monimiaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 134, 135. 20 Mr 1914.

Includes *Siparuna dasyantha* and *S. heteropoda*, spp. nov.

Phelps, O. P. Unusual plants found in Salisbury, Connecticut. Rhodora **16**: 96. 11 My 1914.

Pilger, R. Gramineae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 112, 113. 20 Mr 1914.

Includes *Pariana Ulei* sp. nov. from Brazil.

Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 109–142. 20 Mr 1914; 143–179. 4 Ap 1914.

Includes articles by Brause, Engler & Krause, Malme, Schlechter, Heimerl, Diels, Perkins, Schulz, Brand, Krause, Radlkofer, Ulbrich, Harms, and Pilger, here indexed separately.

Pilger, R. Rapateaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 119, 120. 20 Mr 1914.

Includes *Rapatea Ulei* Pilger.

Pilger, R. Rosaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 136–142. 20 Mr 1914.

Includes eleven new species in *Moquilea* (1), *Licania* (2), and *Hirtella* (8).

Piper, C. V. *Wyethia helianthoides* Nuttall and *Wyethia amplexicaulis* Nuttall. Proc. Biol. Soc. Washington **27**: 97, 98. 11 My 1914.

Wyethia Cusickii sp. nov.

Pittier, H. New or noteworthy plants from Colombia and Central America—4. Contr. U. S. Herb. **18**: 69–86. *pl. 42–56 + f. 76–87*. 16 Ap 1914.

Includes *Brosimum terrabanum*, *Spondias nigrescens*, and *Calocarpum viride*, spp. nov.

Radlkofer, L. Sapindaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 149–156. 4 Ap 1914.

Includes a new species in *Serjania* and eight in *Paullinia*.

Raymond, T. Las especies de eucaliptos más importantes. Rev. Min. Obras Publicas Colombia **8**: 23–49. Ja 1914; 72–81. F 1914.

Schlechter, R. Asclepiadaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 173–179. 4 Ap 1914.

Includes new species in *Blepharodon* (4), *Metastelma* (1), *Ditassa* (3), *Orthosia* (1), *Oxypetalum* (1), *Gonolobus* (1), and *Fimbristemma* (1).

Schlechter, R. Orchidaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 120–126. 20 Mr 1914.

Includes twelve new species.

Schulz, O. E. Erythroxylaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 142. 20 Mr 1914.

Shreve, F. The role of winter temperatures in determining the distribution of plants. Am. Jour. Bot. **1**: 194–202. *f. 1.* 23 My 1914.

Smith, G. M. The cell structure and colony formation in *Scenedesmus*. Archiv Protistenkunde **32**: 278–297. *pl. 16, 17.* 1914.

Smith, J. D. Undescribed plants from Guatemala and other Central American republics. XXXVIII. Bot. Gaz. 57: 415–427. 16 My 1914.

Includes descriptions of twenty new species and one new genus.

Sprague, T. A. *Pithecoctenium cynanchoides.* Curt. Bot. Mag. IV. **10**: *pl. 8556.* My 1914.

A South American plant.

Stapf, O. *Abies magnifica.* Curt. Bot. Mag. IV. **10**: *pl. 8552.* My 1914.

A plant from the northwestern United States.

Stewart, A. Some observations on the anatomy and other features of the "black knot." Am. Jour. Bot. **1**: 112–126. *pl. 9, 10.* 6 My 1914.

Stewart, F. C., & Rankin, W. H. Does *Cronartium ribicola* over-winter on the currant? N. Y. Agr. Exp. Sta. Bull. 374: 41–53. *pl. 1–3 + map.* F 1914.

Stockberger, W. W. The social obligations of the botanist. Science II. **39**: 733–743. 22 My 1914.

Thaxter, R. Note on the ascosporic condition of the genus *Aschersonia* Montagne. Bot. Gaz. **57**: 308–313. *f. 1–7.* 15 Ap 1914.

Thomson, R. B. The spur shoot of the pines. Bot. Gaz. **56**: 362–385. *pl. 20–23.* 16 My 1914.

Torrey, G. S. Two yellow-fruited shrubs. Rhodora **16**: 91, 92. 11 My 1914.

Ulbrich, E. Bombacaceae. In Pilger, R. Plantae Uleanae novae vel minus cognitae. Notizbl. Königl. Bot. Gard. Berlin **6**: 156–166. 4 Ap 1914.

Includes two new species in *Bombax*, *Spirotheca salmonea* gen. et sp. nov., and *Cavanillesia hylogeiton* sp. nov.

Ulbrich, E. Über einige Malvaceen-Gattungen aus der Verwandtschaft von *Gossypium* L. Bot. Jahrb. **50**: (Suppl.) 357–362. 25 Mr 1914.

Vinson, A. E. The effect of climatic conditions on the rate of growth of date palms. Bot. Gaz. **57**: 324–327. *f. 1.* 15 Ap 1914.

Visher, S. S. Additions to the flora of South Dakota—I. Muhlenbergia **9**: 45–52. 19 My 1913.

Vries, H. de. The probable origin of *Oenothera Lamarckiana* Ser. Bot. Gaz. **57**: 345–361. *pl. 17–19.* 16 My 1914.

Wager, R. E. Spring flowers. Nature Study Rev. 10: 174–184. *f. 1–11.* My 1914.

Walton, L. B. The evolutionary control of organisms and its significance. Science II. **39**: 479–488. 3 Ap 1914.

Weatherby, C. A. Old-time Connecticut botanists and their herbaria, —I. Rhodora **16**: 83–90. 11 My 1914.

Weberbauer, A. Die Vegetationsgliederung des nördlichen Peru um 5° südl. Br. Bot. Jahrb. **50**: (Suppl.) 72–94. 25 Mr 1914.

Weingart, W. *Cereus Cavendishii* Monv. and *Cereus Paxtonianus* Monv. Monats. Kakteenk. **24**: 42–45. 15 Mr 1914; 49–51. 15 Ap 1914.

Wells, B. W. Some unreported cecidia from Connecticut. Ohio Nat. **14**: 289–296. *pl. 12, 13.* 24 Ap 1914.

Wernham, H. F. Enumeration of T. A. Sprague's South American plants: Gamopetalae. Kew Bull. Mis. Inf. **1914**: 63–69. Mr 1914.

Wester, P. J. The atemoya, a new fruit for the tropics. Philip. Agr. Rev. 7: 70–72. *pl. 2–15.* F 1914.

Wood, G. C. A preliminary list of the lichens found within a radius of 100 miles of New York City. Torreya **14**: 73–95. 14 My 1914. [Illust.]

Wright, C. H. The genus *Morenia*. Kew Bull. Mis. Inf. **1914**: 77–79. Mr 1914.

Wright, C. H. *Zephyranthes cardinalis*. Curt. Bot. Mag. IV. **10**: *pl. 8553.* My 1914.

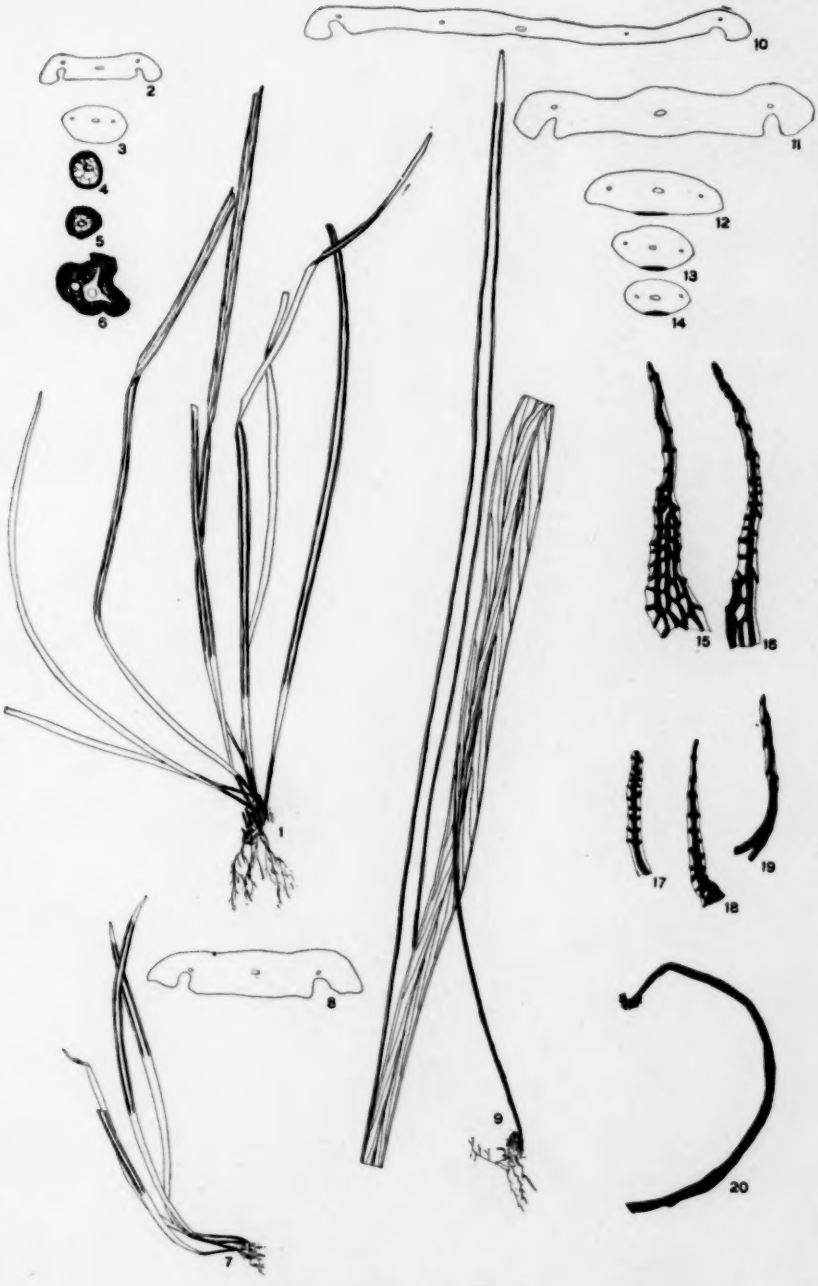
Zillig, H. Die Kultur einiger Sukkulenten. Monats. Kakteenk. **24**: 57–62. 15 Ap 1914.

Zon, R. Balsam fir. U. S. Dept. Agr. Bull. 55: 1–68. *pl. 1, 2 + f. 1–8.* 25 Mr 1914.

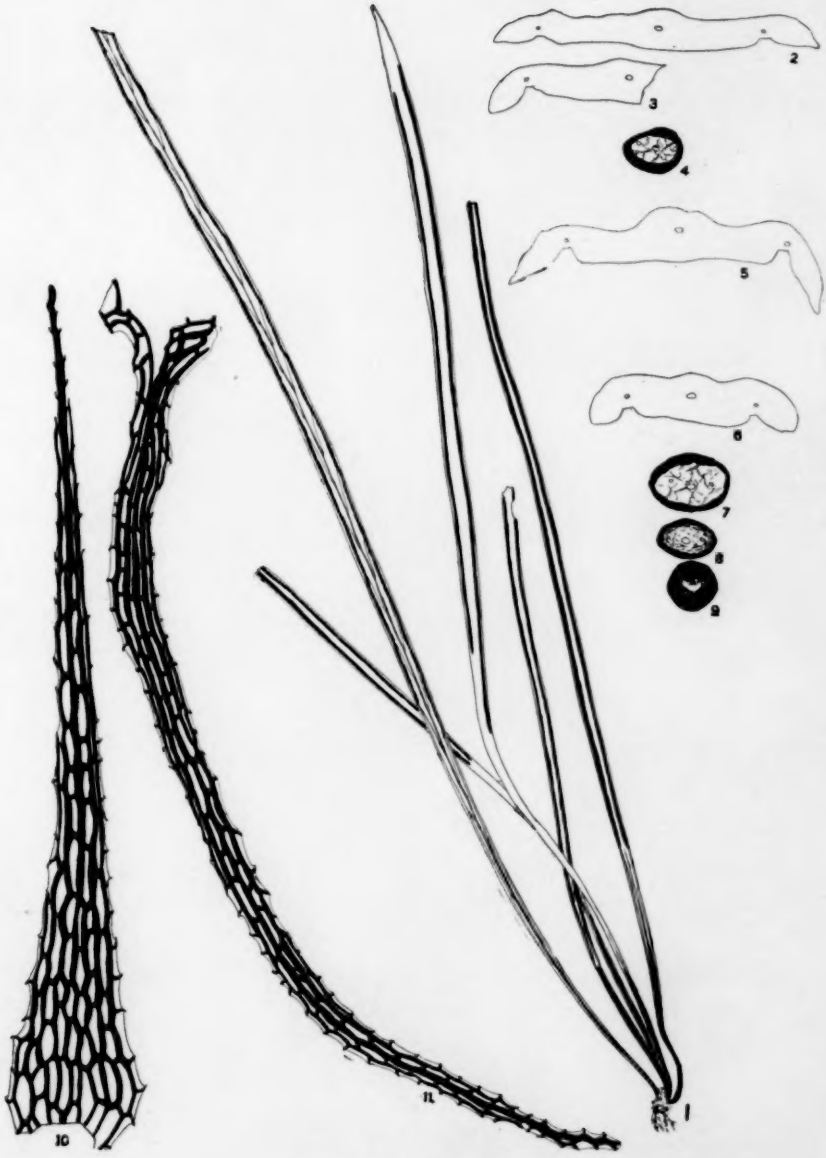
VITTARIA GARDNERIANA FÉE

VITTARIA REMOTA FÉE

VITTARIA LATIFOLIA BENEDICT



VITTARIA STIPITATA KUNZE



VITTARIA RUIZIANA FÉE

VITTARIA WILLIAMSII BENEDICT